United States Environmental Protection Agency
Solid Waste and Emergency Response (5102G)
EPA 542-N-97-001
March 1997
Issue No. 25

EPA TECH TRENDS

CONTENTS

The Applied Technologies Newsletter for Superfund Removals & Remedial Actions & RCRA Corrective Action

ABOUT THIS NEWS

This issue describes public-private technology development partnerships to develop better, cheaper site characterization and remediation technologies. Results of these programs will be reported in future issues.

PARTNERSHIPS

Partnerships Key to Technology Development Efforts

Several ongoing partnerships between regulatory officials, remediation consultants, technology developers, and federal/private site managers have evolved over the last decade to develop innovative technologies. Through these collaborations, stakeholders are voluntarily sharing knowledge, experience, equipment, and facilities to address mutual remediation problems. These efforts have focused on issues such as site-specific needs, engineering problem identification, cost factors, technology performance criteria, and vendor capabilities. The goal is to develop more effective, less costly site characterization and treatment technologies.

Remediation Technologies Development Forum (RTDF)

RTDF members representing industry, government agencies, and academia have joined as partners since 1992. The RTDF consists of several independent partnerships, each focusing on a site remediation technology or problem. Currently these partnerships, or action teams, focus on permeable barriers, the Lasagna™ process, bioremediation, natural ecological restoration of soil-metals, and sediment remediation. Each action team works to identify needs, implement research, address barriers, and share information. For more information, contact Dr. Walter Kovalick, Jr., 703-603-9910, or Robert Olexsey, 513-569-7861, or visit the Clean-Up Information (CLU-IN) site on the World Wide Web (http://clu-in.com).

Consortium for Site Characterization Technology (CSCT)

The CSCT, a partnership of EPA, the U.S. Department of Defense (DoD), and the U.S. Department of Energy (DOE), aims to increase the use of innovative site characterization technologies. It formalizes performance data verification processes and identifies, demonstrates, evaluates, verifies, and transfers technology information. CSCT representatives from these agencies work with small business concerns, instrument and professional societies, state organizations, and private sector stakeholders to identify innovative technologies and potential demonstration sites and to support information distribution. Information may be obtained from Daniel Powell, 703-603-7196, or CLU-IN (http://clu-in.com).

Bioremediation Action Committee (BAC)

The BAC is a public-private partnership of more than 100 experts from government, industry, and academia dedicated to expanding the use of bioremediation at contaminated sites by coordinating research and technology development, transferring information, and identifying priorities. BAC subcommittees focus on specific issues. For example, the Alternative End Points Subcommittee is working to identify ecological, health, and exposure tests that indicate bioavailable fractions of specific contaminants.

*See **Partnerships**, page 2*

TECHNOLOGY

Potential for Phytoremediation Discussed

A December workshop focused on the potential for using phytoremediation to clean up organic contaminants in soil/sediments, surface waters, and shallow ground water. The workshop in Fort Worth, TX, was held to share information on current phytoremediation projects and to gauge attendees' interest in further joint activities. Four mechanisms of phytoremediation are of primary interest: enhanced rhizosphere biodegradation, phytoextraction, phytodegradation, and physical effects such as volatilization.

Phytoremediation occurs when plant roots supply nutrients to microorganisms, thereby enhancing biodegradation. Phytoextraction, the uptake of contaminants by plant roots and the translocation of contaminants into plant shoots and leaves, produces plants that can be harvested and disposed of. Phytodegradation takes advantage of plant tissue enzymes that degrade contaminants. Volatilization occurs when plants take up water-containing organic contaminants and release contaminants into the air through plant leaves.

The advantages of phytoremediation are that it: (1) involves *in situ* processes; (2) is passive, and solar driven; (3) costs only 10 to 20% of mechanical treatments; (4) is faster than natural attenuation; and (5) has high public acceptance. Disadvantages are that phytoremediation is limited to shallow soils, streams, and ground water, and that it can transfer contamination across media.

Field research projects and demonstrations include those conducted on munitions at Army ammunition plants, petroleum at the test facilities of Exxon and Chevron, and waste impoundments in the form of a "living cap" as used by Union Carbide Corporation. Studies include plant screening conducted at the University of Oklahoma. Cooperative pilot tests conducted by the University of Iowa and Auburn University showed significant results; dissolved TNT concentrations decreased from 128 ppm to 10 ppm in one week after plants were introduced into flooded TNT-contaminated soil.

The National Risk Management Research Laboratory in Cincinnati is compiling information on phytoremediation and intends to provide guidance for potential users. Workshop participants agreed that efforts should be made to increase partnering, conduct additional workshops, and compile related testing information electronically. They also agreed that a comprehensive research and development strategy should be developed and potential funding sources, technology developers, and other interest groups should be identified. Participants are planning to meet again. Additional information may be obtained from Phil Sayre in EPA's Technology Innovation Office, 703-603-9915.

Partnerships

continued from page 1

Similarly, the Natural Attenuation Subcommittee addresses methods for identifying candidate sites where natural attenuation is a viable remedy, and the Oil Spills Subcommittee investigates ways in which bioremediation may be accepted more readily for treatment of oil spills. Further information may be obtained from Fran Kremer at 513-569-7346.

Public/Private Partnerships

Through a cooperative agreement with EPA's Technology Innovation Office (TIO), Clean Sites, Inc. facilitates partnerships among private firms and federal agencies to share resources and demonstrate promising technologies. These demonstrations are conducted at existing contaminated sites, and comprehensive cost and performance data are obtained and made available. Ongoing public-private partnerships, which also include federal and state regulators, are planning or conducting demonstrations at seven federal facilities: Two Phase Extraction™ and photolytic destruction at McClellan Air Force Base; membrane pervaporation, *in situ* steam injection, and *in situ* anaerobic bioremediation at DOE's Pinellas Plant; Two Phase Extraction™ and air sparging/soil vapor extraction at DOE's Mound Facility; *in situ* passive treatment walls and vertical hydrofracturing at the Massachusetts Military Reservation/Otis Air National Guard Base; the Lasagna™ process at DOE's Gaseous Diffusion Plant at Paducah, KY; and the NoVOCs System™ at the North Island Naval Air Station and the Marine Corps Air Station Yuma. For more information, contact Eugene Peters of Clean Sites, 703-739-1271, or Daniel Powell of TIO, 703-603-7196.

Strategic Environmental Research and Development Program (SERDP)

SERDP is a multi-agency (Air Force, Army, Navy, and EPA) technology demonstration and evaluation program. The partners provide locations, facilities, and mechanisms for applied research, comparative demonstrations, and comprehensive evaluations. Its goal is to transfer technology from research to full-scale use and from government agencies to the private sector. For additional information, contact Dr. Olufermi Ayorinde, 703-696-2118, or visit the SERDP World Wide Web site (http://hgl.com/serdp).

As EPA's lead in promoting innovative remediation and characterization technology, the Technology Innovation Office (TIO) participates in all of these partnerships. General information concerning these or other potential partnerships may be exchanged with TIO staff at 703-603-9910.

Environmental Expo

The New England Environmental Expo, April 29-May 1, 1997, at the World Trade Center in Boston, MA, is a major conference/exposition for technologies and technology vendors in a broad range of environmental control, management, prevention, and clean-up situations. Additional information may be obtained from Carlos Pachon of TIO at 703-603-9904.

Controlled Phosphate-Enhanced Bioremediation Tested

by Terry Hazen, Westinghouse Savannah River

The U.S. Department of Energy's (DOE's) PHOSter™ system has quadrupled bioremediation rates at DOE and commercial demonstration sites. Developed at DOE's Savannah River Site, PHOSter™ permits the addition of a relatively safe form of organic phosphorus (triethyl phosphate) into air at a rate below the vapor pressure. When injected into water, the air retards dissolution of the nutrient and provides a virtual "time-release" application. In contrast, traditional methods for phosphorous application are known to overstimulate relatively small areas because of their high solubilities and ionizabilities. Since the PHOSter™ injection system operates at low pressures and flow rates, VOC discharges are negligible. In addition, pulsed operations such as these minimize volatilization of VOC's. Demonstration results indicate that PHOSter™ is an efficient and cost effective technology. PHOSter™ is particularly effective at sites with high concentrations of organic material, such as landfills and petroleum facilities. The system was demonstrated at a transportation facility in Augusta-Richmond County, GA, where it operated for 55 days. Using EPA Method 8260, soil analyses showed a 50% reduction in benzene levels and groundwater analyses showed enhanced biodegradation for all BTEX constituents to levels below detection limits. At an abandoned gas station in Aiken, SC, the system produced significant reductions in BTEX levels (at a 11-15 foot depth), as shown in the table below. Because the process was so effective, this demonstration was completed one month early.

Based on the soil characteristics of these demonstration sites, hydraulic conductivity and soil moisture content appear to be major parameters for determining the effectiveness of PHOSter™. For information about demonstrations of PHOSter™, contact Terry Hazen, Westinghouse Savannah River, 803-557-7713.

Constituent	Baseline Concentration	After 131 Days of Treatment
Benzene	1,200 µg/kg	below detection limit
Toluene	11,000 µg/kg	380 µg/kg
Ethylbenzene	6,500 µg/kg	690 µg/kg
Total Xylenes	21,000 µg/kg	3,300 µg/kg
Napthalene	8,400 µg/kg	730 µg/kg

Calendar

In Situ and On-Site Bioremediation: the Fourth International Symposium
Sponsored by Battelle; April 28-May 1, 1997; Marriot Hotel, New Orleans, LA; 800-783-6338.

Second Tri-Service Environmental Technology Workshop
Hosted by the U.S. Army Environmental Center; June 10-12, 1997; Adam's Mark Hotel, St. Louis, MO; 757-865-7604 or e-mail: herrin@stcnet.com.

Second Annual Conference on Phytoremediation
Sponsored by International Business Communications; June 18-19, 1997; Double Tree Guest Suites Hotel, Seattle, WA; 508-481-6400 or e-mail: inq@ibcusa.com.

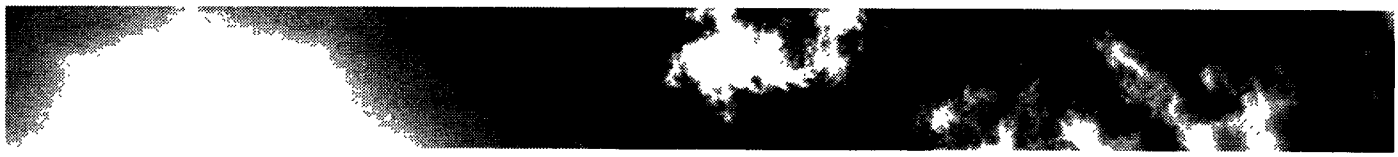
Ninth National Technology Information Exchange (TIE) Workshop
Sponsored by the U.S. DOE Idaho National Engineering Laboratory; August 26-28, 1997; Shilo Inn, Idaho Falls, ID; Gail Kibler, 540-231-4596, or e-mail: gkibler@vt.edu.

Regional Market Opportunities Conferences Set

Remediation market conferences are scheduled this year for the Midwest, July 22-23 in Chicago, and the South Central United States, in New Orleans during November. The conferences provide a forum for federal, state, and private organizations to describe opportunities to participate in various clean-up programs and provide information on assistance programs and resources available to developers. Further information may be obtained from Naomie Smith, 703-603-7186, or Ann Eleanor, 703-603-7199.

Visitor's Day, Consortium for Site Characterization Technologies

The Consortium for Site Characterization Technologies will host a Visitor's Day in conjunction with the New England Environmental Expo in Boston. *(see page 2)* Visitor's may discuss innovative technologies for site characterization with staff available in the exhibition hall throughout the conference April 29-May 1, 1997. Additional information may be obtained from Carlos Pachon, 703-603-9904, or Ann Eleanor, 703-603-7199.



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